

**Notice of Allowability**

Application No.

09/914,170

Applicant(s)

KRISHNAMOORTHY ET AL.

Examiner

Art Unit

Fred Tzeng

2627

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 5/25/2006.
2. ☒ The allowed claim(s) is/are 1-13, 15-18 which are now renumbered as 1-17.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |   |   |
|---|---|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)  | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)           |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____ |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br>Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                   |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material          | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance  |
|   | 9. <input type="checkbox"/> Other _____   |

### DETAILED ACTION

1. This office action is in response to the amendment filed on 5/25/2006.

### EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

3. Authorization for this examiner's amendment was given in a telephone interview with attorney, Mr. Timothy Boller, on 8/22/2006.

4. The application has been amended as follows:

1. (Currently Amended) A method for controlling a motorized mechanism in the event of external power loss, the motorized mechanism comprising first and second motors coupled to a common driving circuit, said first motor being arranged to rotate at a substantially constant rate with external electrical power applied to the driving circuit, the method comprising:

~~wherein~~ in the event of loss of said external electrical power to the driving circuit, controlling the driving circuit ~~is controlled~~ so as to repeatedly connect and disconnect the first and second motors to the driving circuit in substantially out-of-phase synchronism; and

driving the ~~to enable said second motor to be driven with~~ electrical power derived from back-emf of the rotating first motor.

2. (Previously Presented) A method as claimed in claim 1, wherein the motorized mechanism comprises a driving mechanism for a data storage device, wherein the first motor is a spindle motor and the second motor is a read/write head positioning motor.

3. (Currently Amended) In a disk drive having a spindle motor for rotating a data storage disk and a head positioning motor for positioning a read/write head, the spindle motor and positioning motor being coupled to be driven from an external power source by way of a driving circuit, a method for controlling the motors in the event of loss of said external power source during rotation of the spindle motor, the method comprising:

~~wherein repeatedly switching on and off~~ the spindle motor and positioning motor ~~are repeatedly switched on and off from the driving circuit substantially in out-of-phase synchronism; and~~

~~to enable said driving the positioning motor to be driven with electrical power derived from back-emf of the rotating spindle motor.~~

4. (Previously Presented) A method as claimed in claim 3, wherein the spindle motor is coupled to an upper and a lower supply rail of the driving circuit by way of a plurality of respective upper and lower semiconductor switching elements having parallel diode elements, and wherein switching on of the spindle motor corresponds to switching of the lower switching elements to connect the spindle motor to the lower supply rail, and switching off of the spindle motor allows back-emf derived from the spindle motor to generate a recirculating current through the upper switching elements to the upper supply rail.

5. (Previously Presented) A method as claimed in claim 4, wherein the positioning motor is coupled to the upper and lower supply rails of the driving circuit

by pairs of upper and lower semiconductor switching elements, and wherein switching on of the positioning motor corresponds to switching on a selected one of the pairs of switching elements to connect the positioning motor to the upper and lower supply rails to drive the positioning motor with said recirculating current.

6. (Currently Amended). A method for controlling a disk drive having a spindle motor and a positioning motor both coupled to a driving circuit, comprising the steps of:

- detecting a loss of supply power to the driving circuit;
- repeatedly chopping a connection between the spindle motor and the driving circuit to generate an intermittent back-emf derived recirculation current; ~~and~~
- repeatedly chopping a connection between the positioning motor and driving circuit at least substantially synchronized out-of-phase with the chopping of the spindle motor connection to enable driving of the positioning motor using the recirculation ~~current~~; current; and
- maintaining an average positive current through a storage capacitor and clamp circuit.

7. (Currently Amended) A data storage device ~~having~~ comprising:

- a spindle motor for rotatably driving a spindle and/or ~~disk~~; disk;
- a positioning motor for positioning a read and/or write ~~head~~; and head;
- a motor driving circuit coupled to controllably drive the spindle motor and positioning motor under normal operation using an external power supply, the motor driving circuit including a controller adapted to respond to loss of said external power supply by repeatedly chopping connections between the driving circuit and the spindle and positioning motors respectfully in a substantially synchronized out-of-phase manner

to enable driving of the positioning motor with a recirculation current derived from a back-emf of the spindle ~~motor~~, motor; and

a storage capacitor and voltage clamp coupled to the driving circuit,  
wherein the controller is configured to maintain an average positive current through the  
storage capacitor and voltage clamp when driving the positioning motor with the  
recirculation current is enabled.

8. (Currently Amended) A data storage device having  
comprising:

a spindle motor for rotatably driving a spindle and/or ~~disk~~, disk;  
a positioning motor for positioning a read and/or write ~~head~~, head;  
and a motor driving circuit coupled to controllably drive the spindle motor  
and positioning motor under normal operation using an external power supply, the  
motor driving circuit including a controller adapted to respond to loss of said external  
power supply by chopping connection between the driving circuit and the spindle and  
positioning motors respectfully in a substantially synchronized out-of-phase manner to  
enable driving of the positioning motor with a recirculation current derived from a  
back-emf of the spindle motor wherein the driving circuit has an upper and a lower  
supply rail coupled to receive the external power supply under normal operation, and  
includes a storage capacitor and a voltage clamp coupled to the upper supply rail.

9. (Previously Presented) The data storage device of claim 8,  
wherein the spindle motor is coupled to the upper and lower supply rails of the driving  
circuit by way of a plurality of respective upper and lower semiconductor switching  
elements having parallel diode elements, and wherein chopping of the spindle motor  
corresponds to alternately switching on and off the lower switching elements to connect  
the spindle motor to the lower supply rail, wherein switching off the lower switching

elements allows back-emf derived from the spindle motor to generate a recirculation current through the upper switching elements to the upper supply rail.

10. (Previously Presented) The data storage device of claim 8, wherein the positioning motor is coupled to the upper and lower supply rails of the driving circuit by pairs of upper and lower semiconductor switching elements, and wherein chopping of the positioning motor corresponds to switching on and off a selected one of the pairs of switching elements to connect and disconnect the positioning motor to the upper and lower supply rails to selectively drive the positioning motor with said recirculating current.

11. (Previously Presented) A motorized mechanism comprising:  
a first motor;  
a second motor;  
a terminal for receiving external power; and  
a controller coupled to the first motor, the second motor and the terminal for receiving external power and comprising a power rail, wherein the controller is configured in a first mode of operation to generate control signals to operate the first motor at a substantially constant speed and in a second mode of operation to extract power from the first motor for operating the second motor by generating control signals to repeatedly connect and disconnect the power rail from the first and second motors substantially in out-of-phase synchronization.

12. (Previously Presented) The motorized mechanism of claim 11 wherein the motorized mechanism is a data storage device further comprising a spindle and the first motor drives the spindle.

13. (Previously Presented) The motorized mechanism of claim 12 further comprising a storage capacitor and a voltage clamp coupled to the power rail.

14. (Canceled)

15. (Currently Amended) A motorized data storage device comprising:

a first motor;

a second motor;

a terminal for receiving external power;

a controller coupled to the first motor, the second motor and the terminal for receiving external power and comprising a power rail, wherein the controller is configured in a first mode of operation to generate control signals to operate the first motor at a substantially constant speed and in a second mode of operation to extract power from the first motor for operating the second motor by generating control signals to cyclically chop connections between the power rail and the first and second motors substantially in out-of-phase synchronization; ~~The motorized mechanism of claim 14 wherein the motorized mechanism is a data storage device further comprising:~~

a spindle, wherein the first motor drives the spindle; and

a storage capacitor and a voltage clamp coupled to the power rail.

16. (Currently Amended) The motorized ~~mechanism~~ data storage device of claim 15 wherein the controller is configured to generate the control signals in the second mode of operation such that an average current conducted through the storage capacitor and the voltage clamp is positive.

17. (Previously Presented) The method of claim 2 wherein the motorized mechanism further comprises a storage capacitor and a voltage clamp

coupled to a power rail and the driving circuit is controlled such that an average current conducted through the storage capacitor and the voltage clamp is positive.

18. (Previously Presented) The method of claim 3 wherein the disk drive further comprises a storage capacitor and a voltage clamp coupled to a power rail and the driving circuit is controlled such that an average current conducted through the storage capacitor and the voltage clamp is positive.

19-21. (Canceled).

### ***Reason for Allowance***

5. The following is an examiner's statement of reasons for allowance:

Claims 1-13, 15-18 which are now renumbered as 1-17 are allowable over the prior art of record because none of the prior art of record teaches or fairly suggests repeatedly connecting and disconnecting the spindle motor (the first motor) and the stepper motor (the second motor) to the driving circuit in substantially out-of-phase synchronism during a power failure.

6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."



7. Any inquiry concerning this communication from the examiner should be directed to Fred Tzeng whose telephone number is 571-272-7565. The examiner can normally be reached on weekdays from 9:30 am to 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Thi Nguyen can be reached on 571-272-7579. The fax phone numbers for the organization where this application or proceeding is assigned are 571-273-8300 for regular communications and 571-273-7565 for After Final communications.

8. Informal regarding the status of an application may be obtained from the Patent Application Information Retrieval (**PAIR**) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Fred Tzeng", with a stylized flourish at the end.

Fred F. Tzeng

August 22, 2006